Analytical Laboratory

13339 Hagers Ferry Road
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Phone: 980-875-5245 Fax: 980-875-4349

Order Summary Report

Order Number: **J13110158**

Project Name:

Customer Name(s): Bill Kennedy, Wayne Chapman

Customer Address: 3195 Pine Hall Rd
Mailcode: Belews Steam Station
Belews Creek, NC 28012

Lab Contact: Jason C Perkins Phone: 980-875-5348

Report Authorized By: (Signature) _____ **Date:** 12/3/2013
Jason C Perkins

Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2013027419	BELEWS	06-Nov-13 8:05 AM	TO	FGD Purge Eff
2013027420	BELEWS	06-Nov-13 8:10 AM	TO	EQ Tank Eff
2013027421	BELEWS	06-Nov-13 8:15 AM	TO	BIOREACTOR 1 INF
2013027422	BELEWS	06-Nov-13 8:17 AM	TO	BioReactor 2 Inf
2013027423	BELEWS	06-Nov-13 8:17 AM	TO	BioReactor 2 Eff
2013027424	BELEWS	06-Nov-13 2:15 PM	RG	Bio Pilot Eff
2013027425	BELEWS			FILTER BLANK
2013027426	BELEWS	28-Oct-13 4:35 PM	DB	METALS TRIP BLANK

8 Total Samples

Technical Validation Review

Checklist:

COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures).	☑ Yes	☐ No
All Results are less than the laboratory reporting limits.	☐ Yes	☑ No
All laboratory QA/QC requirements are acceptable.	☑ Yes	☐ No

Report Sections Included:

- ☑ Job Summary Report
- ☑ Sample Identification
- ☑ Technical Validation of Data Package
- ☑ Analytical Laboratory Certificate of Analysis
- ☐ Analytical Laboratory QC Report
- ☑ Sub-contracted Laboratory Results
- ☐ Customer Specific Data Sheets, Reports, & Documentation
- ☐ Customer Database Entries
- ☑ Chain of Custody
- ☑ Electronic Data Deliverable (EDD) Sent Separatel

Reviewed By: DBA Account Date: 12/3/2013

Certificate of Laboratory Analysis

Order # J13110158

Site: FGD Purge Eff **Sample #: 2013027419**

Collection Date: 06-Nov-13 8:05 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
INORGANIC IONS BY IC								
Bromide	**99**	mg/L		5	50	EPA 300.0	11/11/2013 15:23	JAHERMA
Chloride	**7000**	mg/L		100	1000	EPA 300.0	11/11/2013 15:23	JAHERMA
MERCURY (COLD VAPOR) IN WATER								
Mercury (Hg)	**219**	ug/L		5	100	EPA 245.1	11/23/2013 10:13	DKJOHN2
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**210**	mg/L		0.5	10	EPA 200.7	11/13/2013 12:22	MHH7131
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**147**	ug/L		10	10	EPA 200.8	11/20/2013 14:02	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**172**	ug/L		10	10	EPA 200.8	11/18/2013 14:49	DJSULL1
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:49	DJSULL1
Chromium (Cr)	**311**	ug/L		10	10	EPA 200.8	11/18/2013 14:49	DJSULL1
Copper (Cu)	**127**	ug/L		10	10	EPA 200.8	11/18/2013 14:49	DJSULL1
Nickel (Ni)	**243**	ug/L		10	10	EPA 200.8	11/18/2013 14:49	DJSULL1
Selenium (Se)	**4080**	ug/L		10	10	EPA 200.8	11/18/2013 14:49	DJSULL1
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:49	DJSULL1
Thallium (Tl)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:49	DJSULL1
Vanadium (V)	**192**	ug/L		10	10	EPA 200.8	11/18/2013 14:49	DJSULL1
Zinc (Zn)	**246**	ug/L		10	10	EPA 200.8	11/18/2013 14:49	DJSULL1
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C
TOTAL DISSOLVED SOLIDS								
TDS	**19000**	mg/L		250	1	SM2540C	11/19/2013 14:19	DSBAKE1
TOTAL SUSPENDED SOLIDS								
TSS	**3200**	mg/L		250	1	SM2540D	11/12/2013 12:27	DSBAKE1

Site: EQ Tank Eff **Sample #: 2013027420**

Collection Date: 06-Nov-13 8:10 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
MERCURY (COLD VAPOR) IN WATER								
Mercury (Hg)	**152**	ug/L		2.5	50	EPA 245.1	11/23/2013 10:15	DKJOHN2
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**194**	mg/L		0.5	10	EPA 200.7	11/13/2013 12:26	MHH7131

Certificate of Laboratory Analysis

Order # J13110158

Site: EQ Tank Eff **Sample #: 2013027420**

Collection Date: 06-Nov-13 8:10 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**122**	ug/L		10	10	EPA 200.8	11/20/2013 14:05	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**145**	ug/L		10	10	EPA 200.8	11/18/2013 14:53	DJSULL1
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:53	DJSULL1
Chromium (Cr)	**264**	ug/L		10	10	EPA 200.8	11/18/2013 14:53	DJSULL1
Copper (Cu)	**105**	ug/L		10	10	EPA 200.8	11/18/2013 14:53	DJSULL1
Nickel (Ni)	**202**	ug/L		10	10	EPA 200.8	11/18/2013 14:53	DJSULL1
Selenium (Se)	**3300**	ug/L		10	10	EPA 200.8	11/18/2013 14:53	DJSULL1
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:53	DJSULL1
Thallium (Tl)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:53	DJSULL1
Vanadium (V)	**177**	ug/L		10	10	EPA 200.8	11/18/2013 14:53	DJSULL1
Zinc (Zn)	**197**	ug/L		10	10	EPA 200.8	11/18/2013 14:53	DJSULL1

Site: BIOREACTOR 1 INF **Sample #: 2013027421**

Collection Date: 06-Nov-13 8:15 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
NITRITE + NITRATE (COLORIMETRIC)								
Nitrite + Nitrate (Colorimetric)	**< 0.01**	mg-N/L		0.01	1	EPA 353.2	11/15/2013 11:37	BGN9034
INORGANIC IONS BY IC								
Bromide	**86**	mg/L		5	50	EPA 300.0	11/11/2013 15:42	JAHERMA
Chloride	**6400**	mg/L		100	1000	EPA 300.0	11/11/2013 15:42	JAHERMA
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**183**	mg/L		0.5	10	EPA 200.7	11/13/2013 12:30	MHH7131
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**88.1**	ug/L		10	10	EPA 200.8	11/20/2013 14:09	DJSULL1

Certificate of Laboratory Analysis

This report shall not be reproduced, except in full.

Order # J13110158

Site: BIOREACTOR 1 INF **Sample #: 2013027421**

Collection Date: 06-Nov-13 8:15 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:56	DJSULL1
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:56	DJSULL1
Chromium (Cr)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:56	DJSULL1
Copper (Cu)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:56	DJSULL1
Nickel (Ni)	**24.6**	ug/L		10	10	EPA 200.8	11/18/2013 14:56	DJSULL1
Selenium (Se)	**76.8**	ug/L		10	10	EPA 200.8	11/18/2013 14:56	DJSULL1
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:56	DJSULL1
Thallium (Tl)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:56	DJSULL1
Vanadium (V)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:56	DJSULL1
Zinc (Zn)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 14:56	DJSULL1
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C
TOTAL DISSOLVED SOLIDS								
TDS	**14000**	mg/L		25	1	SM2540C	11/19/2013 14:19	DSBAKE1
TOTAL SUSPENDED SOLIDS								
TSS	**< 5**	mg/L		5	1	SM2540D	11/12/2013 12:27	DSBAKE1

Site: BioReactor 2 Inf **Sample #: 2013027422**

Collection Date: 06-Nov-13 8:17 AM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**187**	mg/L		0.5	10	EPA 200.7	11/13/2013 12:34	MHH7131
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:00	DJSULL1
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:00	DJSULL1
Chromium (Cr)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:00	DJSULL1
Copper (Cu)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:00	DJSULL1
Nickel (Ni)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:00	DJSULL1
Selenium (Se)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:00	DJSULL1
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:00	DJSULL1
Thallium (Tl)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:00	DJSULL1
Vanadium (V)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:00	DJSULL1
Zinc (Zn)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:00	DJSULL1

Certificate of Laboratory Analysis

Order # J13110158

Site: BioReactor 2 Inf — **Sample #: 2013027422**
Collection Date: 06-Nov-13 8:17 AM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst

Site: BioReactor 2 Eff — **Sample #: 2013027423**
Collection Date: 06-Nov-13 8:17 AM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
NITRITE + NITRATE (COLORIMETRIC)								
Nitrite + Nitrate (Colorimetric)	**< 0.01**	mg-N/L		0.01	1	EPA 353.2	11/15/2013 11:34	BGN9034
INORGANIC IONS BY IC								
Bromide	**86**	mg/L		5	50	EPA 300.0	11/11/2013 16:01	JAHERMA
Chloride	**6300**	mg/L		100	1000	EPA 300.0	11/11/2013 16:01	JAHERMA
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**194**	mg/L		0.5	10	EPA 200.7	11/13/2013 12:38	MHH7131
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 5**	ug/L		5	5	EPA 200.8	11/18/2013 15:13	DJSULL1
Cadmium (Cd)	**< 5**	ug/L		5	5	EPA 200.8	11/18/2013 15:13	DJSULL1
Chromium (Cr)	**< 5**	ug/L		5	5	EPA 200.8	11/18/2013 15:13	DJSULL1
Copper (Cu)	**< 5**	ug/L		5	5	EPA 200.8	11/18/2013 15:13	DJSULL1
Nickel (Ni)	**< 5**	ug/L		5	5	EPA 200.8	11/18/2013 15:13	DJSULL1
Selenium (Se)	**< 5**	ug/L		5	5	EPA 200.8	11/18/2013 15:13	DJSULL1
Silver (Ag)	**< 5**	ug/L		5	5	EPA 200.8	11/18/2013 15:13	DJSULL1
Thallium (Tl)	**< 5**	ug/L		5	5	EPA 200.8	11/18/2013 15:13	DJSULL1
Vanadium (V)	**< 5**	ug/L		5	5	EPA 200.8	11/18/2013 15:13	DJSULL1
Zinc (Zn)	**< 5**	ug/L		5	5	EPA 200.8	11/18/2013 15:13	DJSULL1
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C

Site: Bio Pilot Eff — **Sample #: 2013027424**
Collection Date: 06-Nov-13 2:15 PM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
NITRITE + NITRATE (COLORIMETRIC)								
Nitrite + Nitrate (Colorimetric)	**< 0.01**	mg-N/L		0.01	1	EPA 353.2	11/15/2013 11:29	BGN9034
Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**	ug/l				Vendor Method		V_AS&C

Certificate of Laboratory Analysis

Order # J13110158

Site: Bio Pilot Eff — **Sample #: 2013027424**
Collection Date: 06-Nov-13 2:15 PM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**186**	mg/L		0.5	10	EPA 200.7	11/13/2013 12:42	MHH7131
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**72.7**	ug/L		10	10	EPA 200.8	11/20/2013 14:12	DJSULL1
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:16	DJSULL1
Cadmium (Cd)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:16	DJSULL1
Chromium (Cr)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:16	DJSULL1
Copper (Cu)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:16	DJSULL1
Nickel (Ni)	**19.0**	ug/L		10	10	EPA 200.8	11/18/2013 15:16	DJSULL1
Selenium (Se)	**63.5**	ug/L		10	10	EPA 200.8	11/18/2013 15:16	DJSULL1
Silver (Ag)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:16	DJSULL1
Thallium (Tl)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:16	DJSULL1
Vanadium (V)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:16	DJSULL1
Zinc (Zn)	**< 10**	ug/L		10	10	EPA 200.8	11/18/2013 15:16	DJSULL1
SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)								
Vendor Parameter	**Complete**					Vendor Method		V_AS&C

Site: FILTER BLANK — **Sample #: 2013027425**
Collection Date: — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
DISSOLVED METALS BY ICP-MS								
Selenium (Se)	**< 1**	ug/L		1	1	EPA 200.8	11/20/2013 13:26	DJSULL1

Site: METALS TRIP BLANK — **Sample #: 2013027426**
Collection Date: 28-Oct-13 4:35 PM — Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP								
Boron (B)	**< 0.05**	mg/L		0.05	1	EPA 200.7	11/13/2013 11:41	MHH7131

Certificate of Laboratory Analysis

Order # J13110158

Site: METALS TRIP BLANK **Sample #: 2013027426**

Collection Date: 28-Oct-13 4:35 PM Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP-MS								
Arsenic (As)	**< 1**	ug/L		1	1	EPA 200.8	11/18/2013 14:09	DJSULL1
Cadmium (Cd)	**< 1**	ug/L		1	1	EPA 200.8	11/18/2013 14:09	DJSULL1
Chromium (Cr)	**< 1**	ug/L		1	1	EPA 200.8	11/18/2013 14:09	DJSULL1
Copper (Cu)	**< 1**	ug/L		1	1	EPA 200.8	11/18/2013 14:09	DJSULL1
Nickel (Ni)	**< 1**	ug/L		1	1	EPA 200.8	11/18/2013 14:09	DJSULL1
Selenium (Se)	**< 1**	ug/L		1	1	EPA 200.8	11/18/2013 14:09	DJSULL1
Silver (Ag)	**< 1**	ug/L		1	1	EPA 200.8	11/18/2013 14:09	DJSULL1
Thallium (Tl)	**< 1**	ug/L		1	1	EPA 200.8	11/18/2013 14:09	DJSULL1
Vanadium (V)	**< 1**	ug/L		1	1	EPA 200.8	11/18/2013 14:09	DJSULL1
Zinc (Zn)	**< 1**	ug/L		1	1	EPA 200.8	11/18/2013 14:09	DJSULL1

APPLIED SPECIATION AND CONSULTING, LLC

18804 Northcreek Parkway Bothell, WA, 98011
Tel: (425) 483-3300 Fax: (425) 483-9818
www.appliedspeciation.com

November 27, 2013

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078
(704) 875-5245

Project: Fontier Pilot (Belews Creek) WWTS (Weekly Sampling) (LIMS# J13110158)

Mr. Perkins,

Attached is the report associated with five (5) aqueous samples submitted for total mercury, hexavalent chromium, and selenium speciation analyses on November 11, 2013. The samples were received in a sealed cooler at -0.2°C on November 12, 2013. Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). Hexavalent chromium analysis was performed via ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS). Selenium speciation analysis was performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Any issues associated with the analyses are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078

Project: Fontier Pilot (Belews Creek) WWTS (Weekly Sampling) (LIMS# J13110158)

November 27, 2013

1. Sample Reception

Four (4) aqueous samples were submitted for hexavalent chromium and selenium speciation analyses on November 11, 2013. Four (4) additional samples were submitted for total mercury quantitation. All samples were received in acceptable condition on November 12, 2013 in a sealed container at -0.2°C.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample submitted for hexavalent chromium analysis was filtered (0.45um) and stored in a secure refrigerator maintained at a temperature of 4^{o}C, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45µm) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).

2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

Hexavalent Chromium Analysis by IC-ICP-DRC-MS Prior to analysis, all samples were injected directly into autosampler vials. No further sample preparation was performed as any chemical alteration of the samples may shift the equilibrium of the system resulting in changes in speciation ratios.

Selenium Speciation Analysis by IC-ICP-CRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45µm) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

Total Mercury Quantitation by CV-ICP-MS The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on November 18, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio (m/z) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Hexavalent Chromium Analysis by IC-ICP-DRC-MS Each sample for hexavalent chromium analysis was analyzed by ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS) on November 26, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic (pH > 7)

gradient. The eluting chromium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (DRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

Selenium Speciation Analysis by IC-ICP-CRC-MS Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on November 15, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic (pH > 7) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. All quality control parameters associated with these samples were within acceptance limits.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL values for methylseleninic acid and selenomethionine are calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL values for hexavalent chromium and mercury are calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Total Mercury, Hexavalent Chromium, and Selenium Speciation Results for Duke Energy
Project Name: Fontier Pilot (Belews Creek) WWTS (Weekly Sampling)
Contact: Jay Perkins
LIMS #J13110158

Date: November 27, 2013
Report Generated by: Jeremy Maute
Applied Speciation and Consulting, LLC

Sample Results

Sample ID	Total Hg	Cr(VI)	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	NR	1.8	74.0	50.5	ND (< 2.1)	3.1	ND (< 1.7)	0 (0)
BioReactor 1 Inf	0.232	ND (< 1.0)	18.5	35.9	ND (< 0.53)	0.65	ND (< 0.43)	2.64 (1)
BioReactor 2 Inf	0.0345	NR	NR	NR	NR	NR	NR	NR
BioReactor 2 Eff	0.0076	1.6	ND (< 0.47)	ND (< 0.30)	ND (< 0.53)	ND (< 0.43)	ND (< 0.43)	0 (0)
Bio Pilot Eff	0.0725	ND (< 1.0)	17.3	36.3	ND (< 0.53)	ND (< 0.43)	ND (< 0.43)	0 (0)

All results reflect the applied dilution and are reported in µg/L
NR = Analysis not requested
ND = Not detected at the applied dilution
SeCN = Selenocyanate
MeSe(IV) = Methylseleninic acid
SeMe = Selenomethionine
Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS
n = number of unknown Se species observed

Total Mercury, Hexavalent Chromium, and Selenium Speciation Results for Duke Energy
Project Name: Fontier Pilot (Belews Creek) WWTS (Weekly Sampling)
Contact: Jay Perkins
LIMS #J13110158

Date: November 27, 2013
Report Generated by: Jeremy Maute
Applied Speciation and Consulting, LLC

Quality Control Summary - Preparation Blank Summary

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 5x	eMDL 250x	eMDL 1000x
Hg	-0.0003	-0.0002	-0.0007	-0.0004	-0.0004	0.0002	0.0001	0.0006	-	-
Cr(VI)	-0.8	-0.4	-0.2	0.0	-0.3	0.3	0.002	-	-	1.0
Se(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.47	1.9
Se(VI)	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-	0.30	1.2
SeCN	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.53	2.1
MeSe(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.43	1.7
SeMe	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.43	1.7

eMDL = Estimated Method Detection Limit
*Please see narrative regarding eMDL calculations

Quality Control Summary - Certified Reference Materials

Analyte (µg/L)	CRM	True Value	Result	Recovery
Hg	NIST 1641d	1568	1626	103.7
Cr(VI)	LCS	1.000	1.054	105.4
Se(IV)	LCS	9.57	9.28	96.9
Se(VI)	LCS	9.48	9.22	97.3
SeCN	LCS	8.92	8.55	95.9
MeSe(IV)	LCS	6.47	6.23	96.3
SeMe	LCS	9.32	8.84	94.8

Total Mercury, Hexavalent Chromium, and Selenium Speciation Results for Duke Energy
Project Name: Fontier Pilot (Belews Creek) WWTS (Weekly Sampling)
Contact: Jay Perkins
LIMS #J13110158

Date: November 27, 2013
Report Generated by: Jeremy Maute
Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Duplicates

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Hg	Batch QC	0.1934	0.1955	0.1945	1.1
Cr(VI)	Bio Pilot Eff	ND (< 1.0)	ND (< 1.0)	NC	NC
Se(IV)	Bio Pilot Eff	17.33	18.07	17.70	4.2
Se(VI)	Bio Pilot Eff	36.27	38.29	37.28	5.4
SeCN	Bio Pilot Eff	ND (< 0.53)	ND (< 0.53)	NC	NC
MeSe(IV)	Bio Pilot Eff	ND (< 0.43)	ND (< 0.43)	NC	NC
SeMe	Bio Pilot Eff	ND (< 0.43)	ND (< 0.43)	NC	NC

ND = Not detected at the applied dilution
NC = Value was not calculated due to one or more concentrations below the eMDL

Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Hg	Batch QC	2.000	2.347	107.6	2.000	2.320	106.3	1.2
Cr(VI)	Bio Pilot Eff	1000	986.4	98.6	1000	986.9	98.7	0.0
Se(IV)	Bio Pilot Eff	1390	1312	93.1	1390	1344	95.4	2.4
Se(VI)	Bio Pilot Eff	1261	1203	92.4	1261	1224	94.1	1.7
SeCN	Bio Pilot Eff	1144	1037	90.6	1144	1056	92.3	1.8

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

Duke Energy

Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only
ORDER# J13 110132 MATRIX: OTHER
Logged By BGEORGE Date & Time 11/7/13 11:00
Samples Originating From NC___ SC___
SAMPLE PROGRAM Ground Water___ NPDES___ Drinking Water___ UST___ RCRA Waste___
Cooler Temp (C) 0.3

[19]Page 1 of 2
DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

AS&C
PO #650910

Customer must Complete

[1]Project Name	Fontier Pilot (Belews Creek) WWTS (Weekly Sampling)	[2]Phone No:	
[2] Client:	Bill Kennedy, Wayne Chapman	[4]Fax No:	
[5]Business Unit:	20006	[6]Process: SFHDW1205	Mail Code:
[8]Oper. Unit:	FHGO	[9]Res. Type: 3500	[10]Reso. Center: 1830000

Customer to complete all appropriate non-shaded areas.

[15]Preserv.: 1=HCl, 2=H_2SO_4, 3=HNO_3, 4=Ice, 5=None

LAB USE ONLY

Customer to complete appropriate columns from left to right

[11]Lab ID	Se Speciation Bottle ID	[13]Sample Description or ID	Sampling conducted: Every Wednesday Date	Time	Signature	[17]Comp.	[18]Grab	[16]Analyses Required: TDS, TSS •	Br, Cl (Dionex)	Metals* + Hg** •	Se (IMS), filtered	Hg 200.8 (V_AS&C)	Nitrate	Cr, Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)
20130273[illegible]	419	FGD Purge Eff	11-6-13	0805	TO			1	1	1	1			1
20130273[illegible]	420	EQ Tank Eff.	11-6-13	0810	TO					1	1			
20130273[illegible]	421	BioReactor 1 Inf	11-6-13	0815	TO			1	1	1**	1	1	1	1
20130273[illegible]	422	BioReactor 2 Inf	11-6-13	0817	TO					1**		1		
20130273[illegible]	423	BioReactor 2 Eff	11-6-13	08:17	TO				1	1**		1	1	1
20130273[illegible]	424	Bio Pilot Eff	11-6-13	14:15	RC					1**	1	1	1	1
20130273[illegible]		mF Pilot Eff	n/A	n/A	NO sample			1	1	1**	1	1	1	1
	425	Filter Blk									1			
20130273[illegible]	426	Metals Trip Blk	11/6/13	1635	D. Bal					1**				

Filtering of the Se is performed in the field please provide a filter blank too.

BIO 2 INF mislabeled should have been BIO 2 EFF

Customer to sign & date below - fill out from left to right.

1) Relinquished By: Phil Gossett	Date/Time: 11/6/13 14:30	2) Accepted By:	Date/Time: 11/7/13 11:00
3) Relinquished By:	Date/Time:	4) Accepted By: Danny Culbreth	Date/Time: 11/12/13 9:00 Temp -0.2C
5)Relinquished By:	Date/Time:	6)Accepted By:	Date/Time:
7)Relinquished By:	Date/Time: 11/11/13 8:00	8)Accepted By:	Date/Time:
9)Seal/Locked By	Date/Time: 11/11/13 8:00	10) Seal/Lock Opened By	Date/Time:
11)Seal/Locked By	Date/Time:	12)Seal/Lock Opened By	Date/Time:

Comments

* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn, V, Tl by TRM/IMS 1**=No Hg

Customer, IMPORTANT! Please indicate desired turnaround.

[22]Requested Turnaround
14 Days 11/20/13
*7 Days
*48 Hr
*Other
* Add. Cost Will Apply

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

[19]Page 1 of 2

DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

Duke Energy

Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only

ORDER#	MATRIX: OTHER	Samples Originating From	NC___ SC___
J13 110132 58 (11/8)			

Logged By	Date & Time	SAMPLE PROGRAM
BGeorge	11/7/13 11:00	Ground Water ___ NPDES ___ Drinking Water ___ UST ___ RCRA Waste ___

Cooler Temp (C): 0.3

AS&C
PO #650910

1)Project Name: Fontier Pilot (Belews Creek) WWTS (Weekly Sampling)		2)Phone No:	
2) Client: Bill Kennedy, Wayne Chapman		4)Fax No:	
5)Business Unit: 20006	6)Process: SFHDW1205	Mail Code:	
8)Oper. Unit: FHGO	9)Res. Type: 3500	10)Reso. Center: 1830000	

Customer must Complete

Customer to complete all appropriate non-shaded areas.

Sampling conducted: Every Wednesday

[15]Preserv.:1=HCL 2=H_2SO_4 3=HNO_3 4=Ice 5=None

[16]Analyses Required

LAB USE ONLY [11]Lab ID	Se Speciation Bottle ID	[13]Sample Description or ID	Date	Time	Signature	[17]Comp.	[18]Grab	TDS, TSS		Br, Cl (Dionex)	Metals* + Hg**	Se (IMS), filtered		Hg 200.8 (V_AS&C)	Nitrate		Cr, Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)			
Preserv.								4		4	3,4	3,4					4			
2013027312	419	FGD Purge Eff	11-6-13	0805	TO			1		1	1	1					1			
2013027314	420	EQ Tank Eff.	11-6-13	0810	TO						1	1								
2013027315	421	BioReactor 1 Inf	11-6-13	0815	TO			1		1	1**	1		1	1		1			
2013027316	422	BioReactor 2 Inf	11-6-13	0817	TO						1**			1						
2013027317	423	BioReactor 2 Eff	11-6-13	08:17	TO					1	1**			1	1		1			
2013027318	424	Bio Pilot Eff	11-6-13	14:15	PG						1**	1		1	1		1			
~~2013027319~~		~~mF Pilot Eff~~	n/A	n/A	NO sample			~~1~~		~~1~~	~~1**~~	~~1~~		~~1~~	~~1~~		~~1~~			
~~201302773~~																				
2013027321	425	Filter Blk										1								
2013027329	426	Metals Trip Blk	10/28/13	1635	D. Bel						1**									

BG 11/8

Customer to complete appropriate columns to right

Filtering of the Se is performed in the field please provide a filter blank too.

BIO 2 INF mis labeled should ~~HAVE BEEN~~ BIO2 EFF

Customer to sign & date below - fill out from left to right.

	Date/Time		Date/Time
1) Relinquished By: Phil Gossett	11/6/13 14:30	2) Accepted By: BG	11/7/13 11:00
3) Relinquished By		4) Accepted By	
5)Relinquished By		6)Accepted By:	
7)Relinquished By: BG	11/11/13 8:00	8)Accepted By:	
9)Seal/Locked By: BG	11/11/13 8:00	10) Seal/Lock Opened By	
11)Seal/Locked By		12)Seal/Lock Opened By	

Comments
* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn, V, Tl by TRM/IMS 1**=No Hg

Customer, IMPORTANT! Please indicate desired turnaround.

[22]**Requested Turnaround**

14 Days ______
*7 Days ______
48 Hr ______
*Other ______
* Add. Cost Will Apply